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CSC354 – Assignment1 – ML – Concept Learning

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FA21-BSE-075

Question 1: Using the Candidate-Elimination algorithm, find (manually) the set of all hypotheses consistent with the following training instances. Show step-by-step complete working of the algorithm.

Vector Representation:

x1= < Japan, Honda, Blue, 1980, Economy > +

x2= < Japan, Toyota, Green, 1970, Sports > -

x3= < Japan, Toyota, Blue, 1990, Economy > +

x4= < USA, Chryler, Red, 1980, Economy > -

x5= < Japan, Honda, White, 1980, Economy > +

Candidate elimination Algorithm

S = < ∅, ∅, ∅, ∅, ∅ >

G = < ?, ?, ?, ?, ? >

After x1:

S = < Japan, Honda, Blue, 1980, Economy >

G = < ?, ?, ?, ?, ? >

After x2:

S = < Japan, Honda, Blue, 1980, Economy >

G = {< USA, ?, ?, ?, ? >, < ?, Honda, ?, ?, ? >, < ?, Chryler, ?, ?, ? >, < ?, ?, Blue, ?, ? >, < ?, ?, Red, ?, ? >, < ?, ?, White, ?, ? >, < ?, ?, ?, 1980, ? >, < ?, ?, ?, 1990, ? >, < ?, ?, ?, ?, Economy >}

After x3:

S = < Japan, ?, Blue, ?, Economy >

G = {< ?, ?, Blue, ?, ? >, < ?, ?, ?, 1990, ? >, < ?, ?, ?, ?, Economy >}

After x4:

S = < Japan, ?, Blue, ?, Economy >

G = {< ?, ?, Blue, ?, ? >, < ?, ?, ?, 1990, ? >, < Japan, ?, ?, ?, Economy >}

After x5:

S = < Japan, ?, ?, ?, Economy >

G = {< Japan, ?, ?, ?, Economy >}

Question 2: Using the Find-S algorithm, find (manually) a hypothesis that is consistent with the following dataset. Show step-by-step complete working of the algorithm.

Face	Hair	Eye	Nose	Mouth	Output
Circle	Yes	Circle	Triangle	Up	+
Square	Yes	Square	Square	Down	-
Circle	Yes	Square	Triangle	Up	+
Circle	No	Circle	Triangle	Down	-
Circle	Yes	Square	Square	Up	+

sad: - happy: +

Vector Representation:

x1= < Circle, Yes, Circle, Triangle, Up > +

x2= < Square, Yes, Square, Square, Down> -

x3= < Circle, Yes, Square, Triangle, Up > +

x4= < Circle, No, Circle, Triangle, Down> -

x5= < Circle, Yes, Square, Square, Up> +

Find-S Algorithm:

h0 = < ∅, ∅, ∅, ∅, ∅ >

h1 = < Circle, Yes, Circle, Triangle, Up >

h2 = < Circle, Yes, ?, Triangle, Up >

h3 = < Circle, Yes, ?, ?, Up >

Trained Model = If Face = Circle **AND** Hair = Yes **AND** Eye = ? **AND** Nose = ? **AND** Mouth = UP **THEN** Output = + (Happy) **OTHERWISE** Output = - (Sad)